

APPENDIX D: SUPPORTING INFORMATION ON BOUNDARY EVALUATION

This appendix provides supporting information for the Boundary Evaluation Action Plan (Section III). The Sanctuary boundary concepts described below were developed in 2000 and 2001 as preliminary working draft options. They were designed to represent a range of potential modifications to the existing Sanctuary boundary.

The boundary concept maps were developed by CINMS staff working in close public consultation with the Sanctuary Advisory Council. These maps depict working versions, not final versions, of possible boundary alternatives. These concepts will be analyzed in a future supplemental environmental impact statement (SEIS), which will include information from a biogeographic study conducted by NOAA's National Centers for Coastal and Ocean Science. The Executive Summary of the biogeographic study is also presented in this appendix. The forthcoming SEIS will present an analysis of boundary alternatives to the public. Public comments will be solicited and responded to before a decision on boundary change, if any, is made by NOAA in the future.

Boundary Concepts

Boundary Concept 1

Boundary Concept 1 includes the entire management plan study area, plus an additional portion over the Santa Lucia bank. At 6,593 square nmi (8,731 square statute miles or mi), it covers the largest area of all boundary concepts. It encompasses the widest range and variety of habitats. Boundary Concept 1 also encompasses the greatest variety of uses and is adjacent to 150 miles of mainland coastline. Human uses encompassed include oil and gas exploration and development, commercial and recreational fishing, other types of recreation, harbors, watersheds, and military use. There are 39 developed oil and gas leases included within Boundary Concept 1. This is the only boundary concept including coastal areas adjacent to harbors.

Boundary Concept 1A

Boundary Concept 1A encompasses 6,586 square nmi (8,722 square mi). Like Concept 1, it includes examples of the features making this area a unique environment: the conjunction of two bioregions as well as the transition area between the two. It also encompasses a range of human activities as varied as Concept 1, except for the exclusion of offshore oil and gas leases and coastal ports and harbors. As is also the case for Concept 1, the Concept 1A area is noted for encompassing a transition zone between two distinct coastal bioregions, where the cold temperate waters of the California Current flowing from the north meet the warm temperate waters of the of the California Countercurrent. Concept 1A also includes mainland coastal area of approximately 150 miles.

The outer boundary of Concept 1A extends slightly north of Point Sal on the north, extends to include a section west of the coast approximately 80 nmi east to west and 50 nmi from north to south. South of this westernmost section, Boundary Concept 1A encompasses the Santa Barbara Channel and areas from approximately 10 to 20 nmi south of the existing Sanctuary boundary. Moving east south of the existing Sanctuary, Boundary Concept 1A then drops south to include the existing Sanctuary around Santa Barbara Island. The boundary then heads north, ending near Point Dume. The boundaries of Concept 1A were also discreetly drawn around state and federal outer continental shelf (OCS) oil and gas leases. In addition, the boundary as it pertains to ports and harbors uses as a baseline the Colreg Line as currently depicted on nautical charts, with adjustments for harbor construction occurring since the line was drawn.

Boundary Concept 2

Boundary Concept 2 encompasses 4,004 square nmi (5,302 square mi), or 62 percent of Boundary Concept 1. Unlike Concepts 1 and 1A, the mainland coastal component of Concept 2 begins at Gaviota and extends north Point Sal. Thus, Concept 2 is not adjacent to more urbanized areas of the mainland coast. As with Concept 1 and 1A, Boundary Concept 2 also includes a wide diversity of marine habitats and species, and examples of the features making this area a unique environment: the conjunction of two bioregions as well as the transition area between the two.

Boundary Concept 3

Boundary Concept 3 encompasses 2,637 square nmi (3,492 square mi). Concept 3 includes a limited connection to a section of rural mainland coast extending from the southern boundary of Vandenberg Air Force Base south past Point Conception and east past Cojo Anchorage. A distinguishing feature of Concept 3 is the mainland coastal component extends to the coast without overlapping state or federal oil and gas leases, and without adjoining any urban coastal areas.

Boundary Concept 4

Boundary Concept 4 includes only offshore areas, and does not contact the coast. This concept encompasses 2,327 square nmi (3,082 square mi), which is 36 percent of Boundary Concept 1. This concept is only slightly larger than the existing Sanctuary, and features a contiguous connection to Santa Barbara Island.

Concept 4 encompasses a larger area than the existing Sanctuary, providing a contiguous connection between the northern Channel Islands and Santa Barbara Island. As with Concepts 1, 1A, and 2, Boundary Concept 4 includes important offshore physical features, including portions of the Santa Barbara Basin. Concept 4 does not include habitats associated with the mainland coast, such as mainland kelp beds, wetlands, and linkages to coastal watersheds. It includes portions of the gray whale migration route, seabird foraging areas, and other important biological features.

Boundary Concept 5

Boundary Concept 5 encompasses 1,322 square nmi (1,751 square mi) and is closest among the concepts to the existing Sanctuary boundary. Concept 5 essentially squares off the existing curved Sanctuary boundary. Like Concept 4, Concept 5 does not include areas of the mainland coast and its associated coastal features and habitats. Concept 5 includes all the unique island habitats but without the connection to Santa Barbara Island.

Boundary Concept Maps and Data Attribute Tables

Figures 58-63 show the boundaries of each boundary concept. Tables 26 and 27 compare various human use activities and environmental features occurring within each of the boundary concepts.

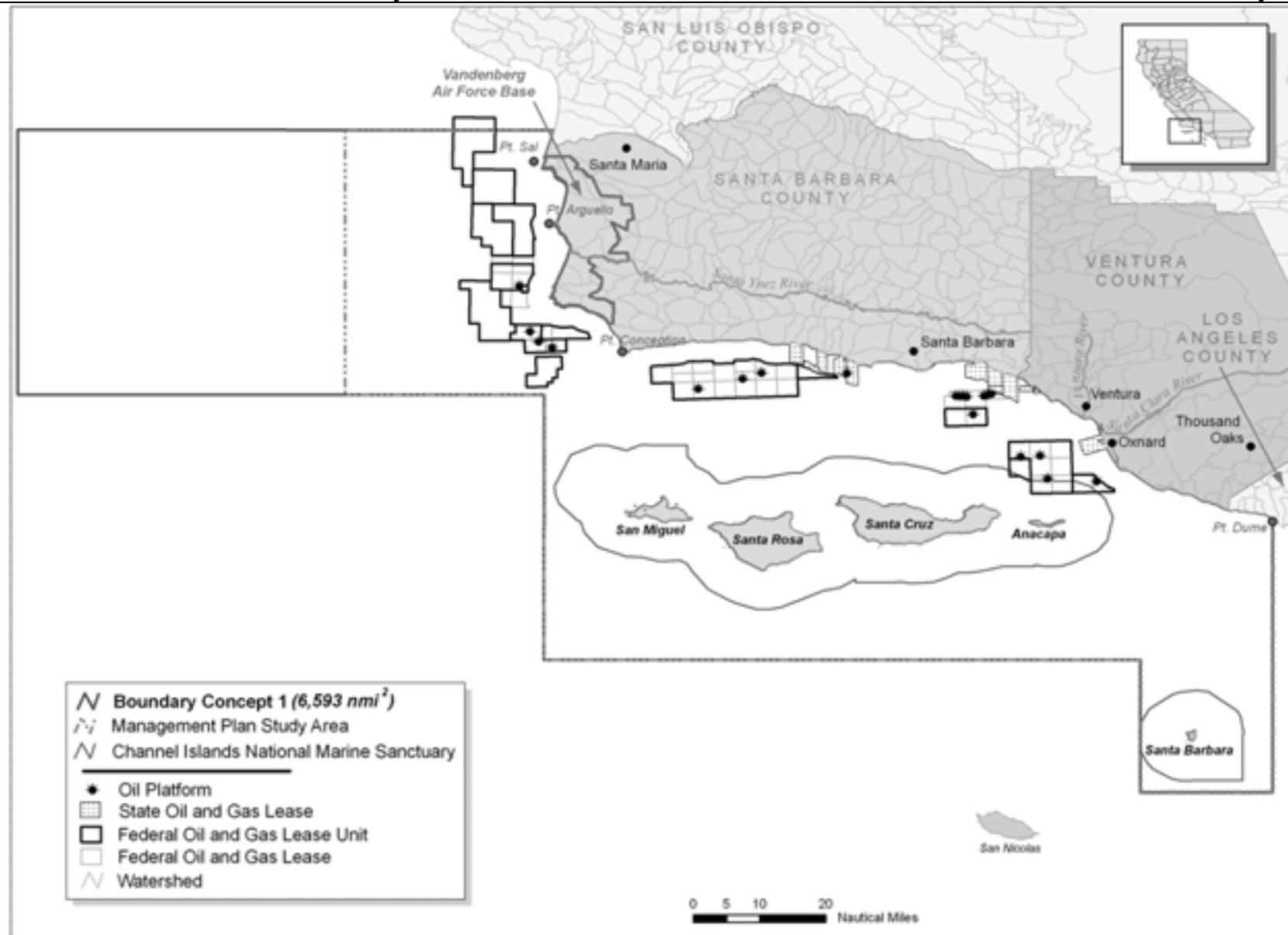


Figure 58. Map of boundary concept 1

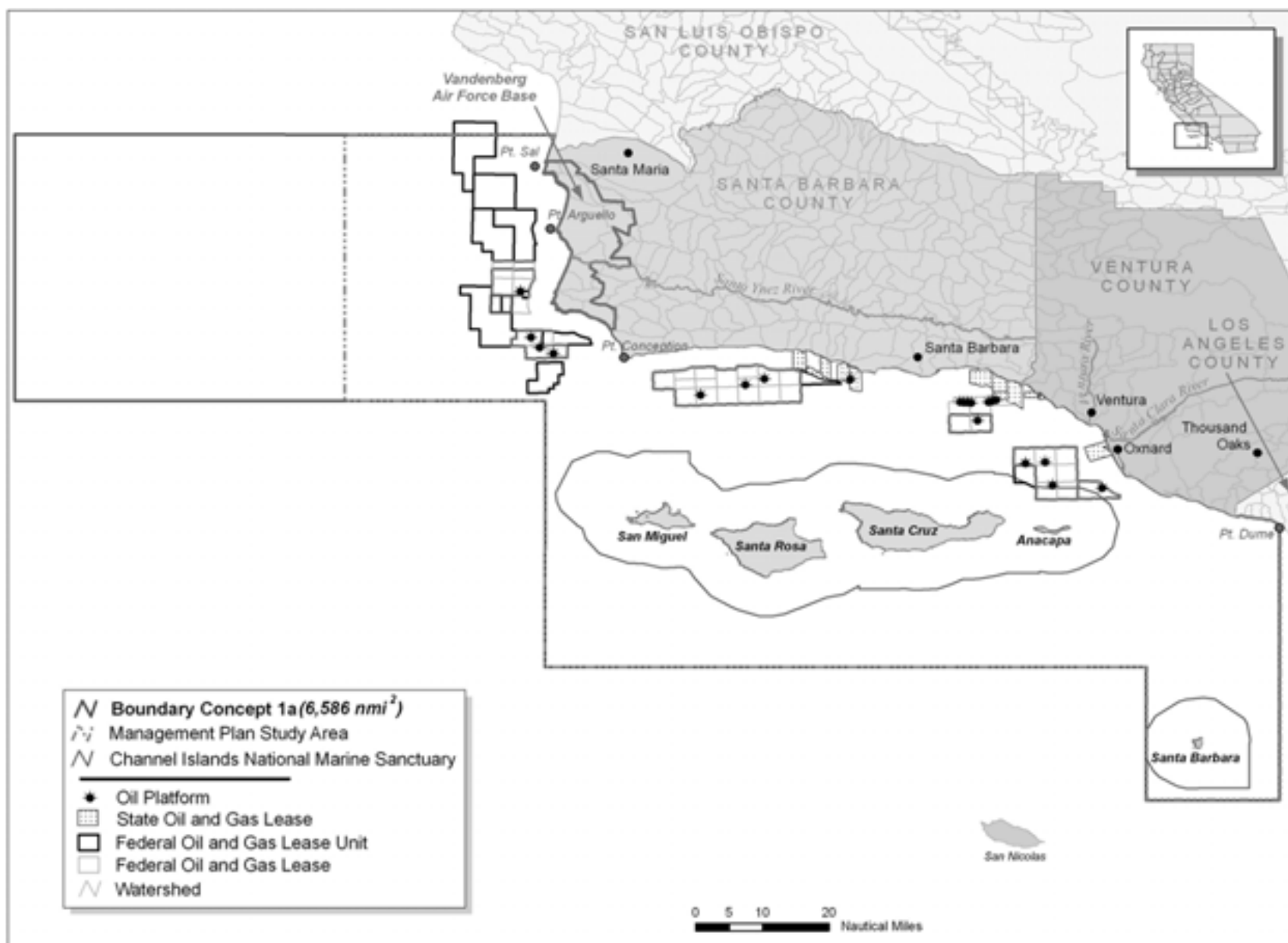


Figure 59. Map of boundary concept 1a

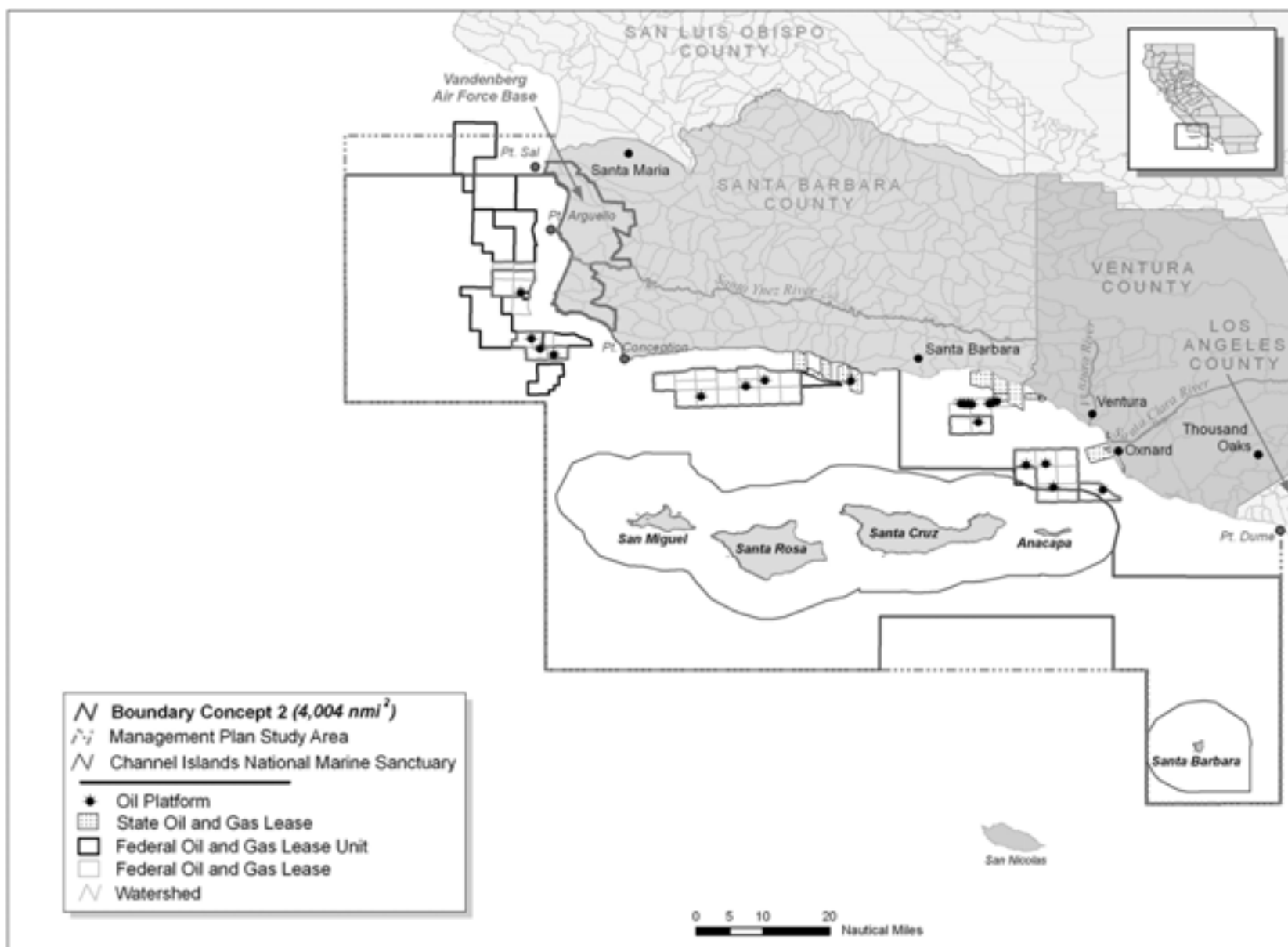


Figure 60. Map of boundary concept 2

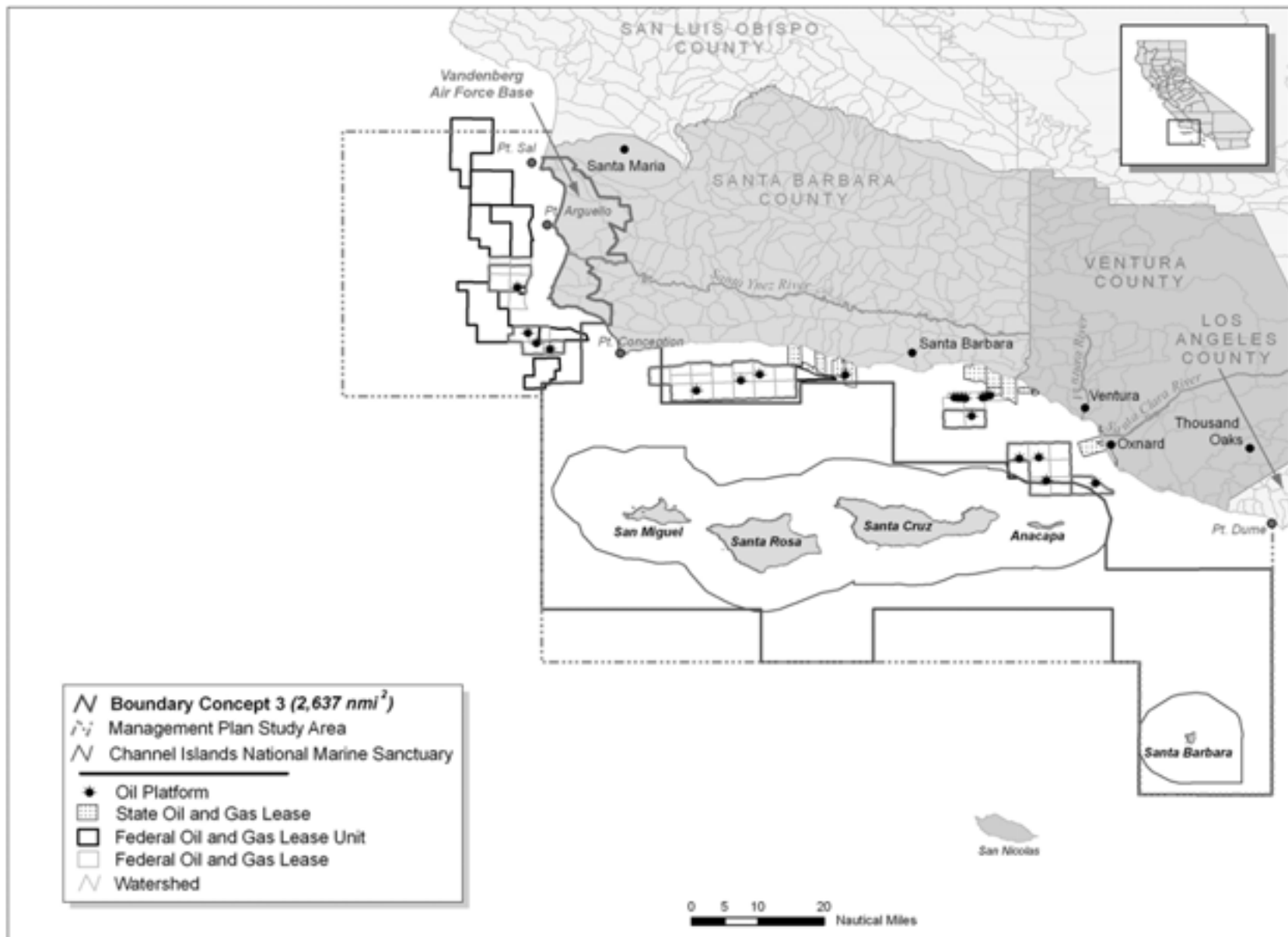


Figure 61. Map of boundary concept 3

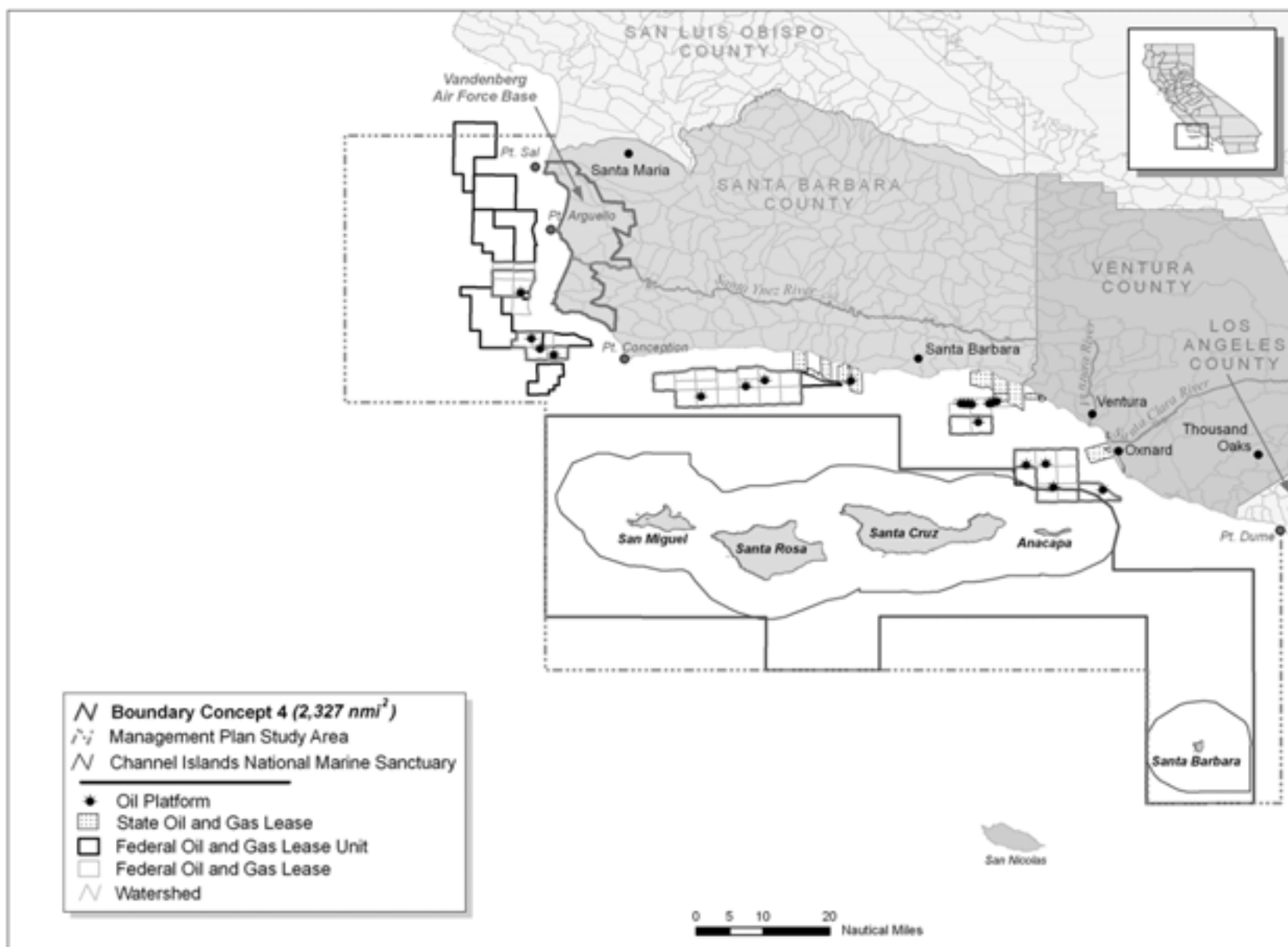


Figure 62. Map of boundary concept 4

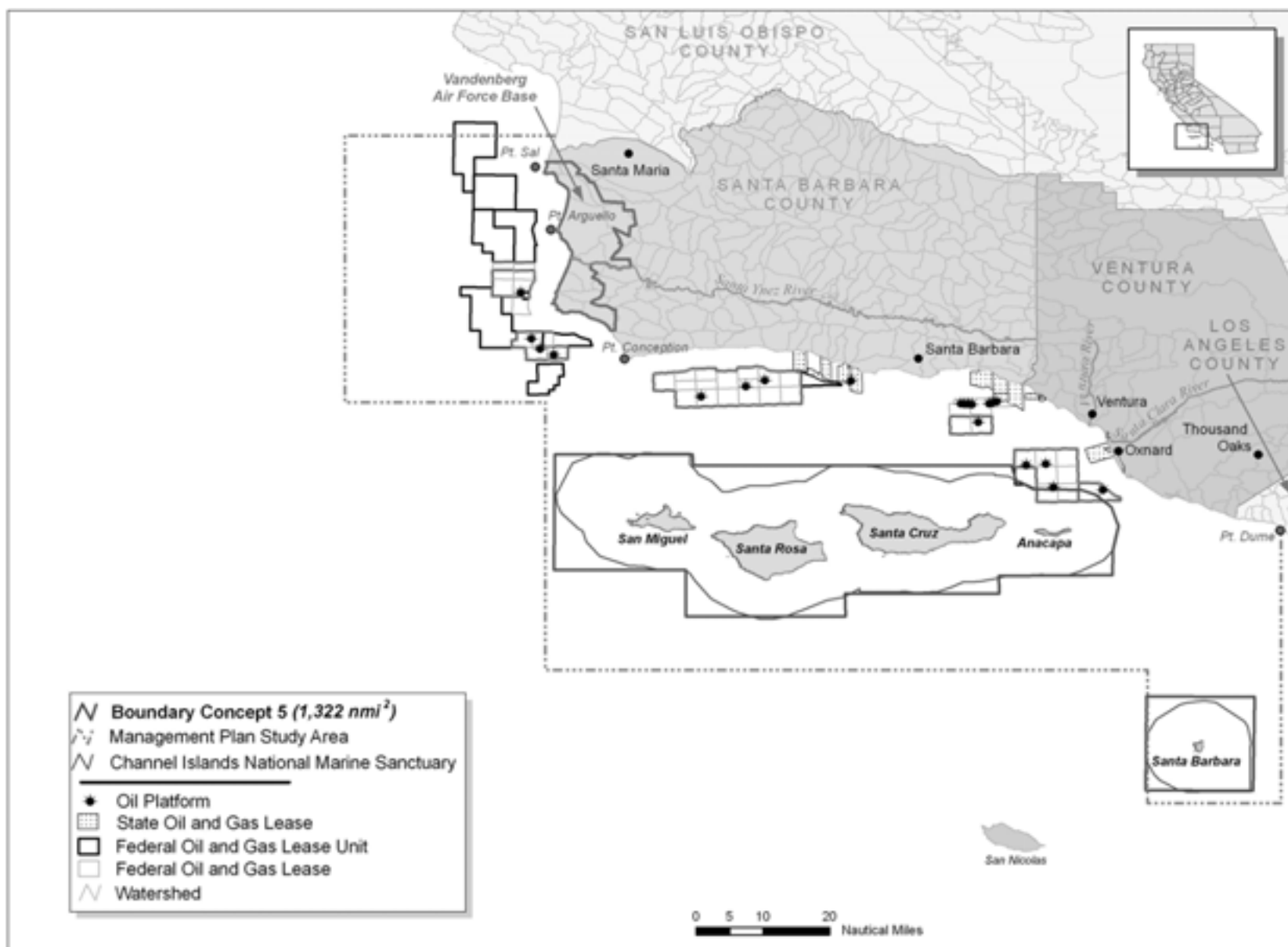


Figure 63. Map of boundary concept 5

Table 26. Comparison of Human Use Attributes for Boundary Concepts*

USES	Significance of Use	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of harbors	<ul style="list-style-type: none"> Focus of commercial and recreational activities. Source of pollutants from vessel-related activity and maintenance. Source of pollutants from dredging, and from construction and maintenance of piers. 	4	0	4	0	0	0	0	0
Number of commercial fish blocks	<ul style="list-style-type: none"> Impact of concentrated human activity on ecological balance. Impacts from various gear types. 	89	27	89	54	58	43	40	27
Number of military installations	<ul style="list-style-type: none"> Concentration of human activity. Support military activities impacting Sanctuary. 	4	0	4	1	1	1	0	0
Miles of Vandenberg AFB coastline	<ul style="list-style-type: none"> Source of launch, helicopter, and flight test noise impacts. Source of debris disposal into Sanctuary waters. 	35	0	35	35	35	3	0	0
Percentage of concept included in Sea Range	<ul style="list-style-type: none"> Source of noise and explosion impacts. Source of debris disposal. 	70%	95%	80%	55%	75%	70%	90%	95%
Number of producing state oil and gas leases	<ul style="list-style-type: none"> Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	2	0	2	0	0	0	0	0
Number of producing federal oil and gas leases	<ul style="list-style-type: none"> Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	19	0	19	0	7	0	0	0
Number of potentially developed federal oil and gas leases	<ul style="list-style-type: none"> Impacts from seismic studies. Impacts from disturbance of the seabed. Impacts from discharge. 	75	0	75	0	62	0	0	0
Percentage of area encompassed by producing or potentially producing oil and gas leases	<ul style="list-style-type: none"> Source of ocean disposal (muds and cuttings). Focus of human activity. Impacts from seismic studies. Impacts from disturbance of the seabed. Impacts from discharge. Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	9%	0%	9%	0%	11%	0%	0%	0%
Number of active oil and gas support facilities (piers, etc.)	<ul style="list-style-type: none"> Support activities impacting offshore areas. Potential source of environmental pollution. Visual impacts of facilities. 	37	0	37	0	16	0	0	0
Number of aquaculture facilities	<ul style="list-style-type: none"> Potential for introduction of exotic species. Potential impacts on water quality and benthic habitats. 	10	0	10	2	2	0	0	0

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*Note: data presented in this table was compiled as of 2000.

Table 26. Comparison of Human Use Attributes for Boundary Concepts*

USES	Significance of Use	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of desalination plants	<ul style="list-style-type: none"> Discharge plume supports only species with broad salinity tolerances Potentially toxic trace elements concentrate in surface layer above discharge plume. Impacts from species entrainment in intakes. 	2	0	2	1	1	0	0	0
Number of Outfalls	<ul style="list-style-type: none"> Source of marine pollution. Sources of pollution to breeding and juvenile development areas for coastal and offshore species. 	10	0	10	4	4	3	0	0
Percent of VTSS within Concept	<ul style="list-style-type: none"> Ships are a source of exotic species. Source of marine pollution. Source of air pollution and noise. Safety issues. 	100%	25%	100%	75%	75%	60%	50%	30%
Percent of area used for recreation (visual estimate)	<ul style="list-style-type: none"> Source of noise disturbance. Source of debris disposal. 	50%	50%	50%	35%	35%	30%	40%	50%

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*Note: data presented in this table was compiled as of 2000.

Table 27. Comparison of Environmental Attributes for Boundary Concepts*

ATTRIBUTES	Significance of Attribute	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Total square miles	<ul style="list-style-type: none"> Indicator of ecosystem representation. 	6,600	1,494	8,731	8,722	5,302	3,492	3,082	1,751
Percentage of total ecosystem represented	<ul style="list-style-type: none"> Extent a complete system is represented. 	100%	19%	100%	62%	57%	43%	36%	21%
Number of plateaus, gyres, banks, & subsea canyons	<ul style="list-style-type: none"> Area's uniqueness connected to geomorphology. Habitat and species diversity. 	7	1	7	5	5	4	3	2
Percentage of continental slope	<ul style="list-style-type: none"> Links to oceanic systems. Promotes upwelling. 	100%	0%	100%	100%	50%	50%	50%	0%
Diversity of bathymetry	<ul style="list-style-type: none"> Benthic habitat and species diversity. 	9	1	9	9	6	5	4	2
Percentage of submerged rocky reef	<ul style="list-style-type: none"> Attachment site for kelp and numerous invertebrates. Food source and habitat protection for fish. 	100%	60%	100%	90%	90%	75%	70%	60%
Percentage of undeveloped mainland coastline	<ul style="list-style-type: none"> Mainland representative of unaltered habitats. Source for comparison studies with islands. 	100%	0%	100%	100%	100%	18%	0%	0%
Number of wetlands	<ul style="list-style-type: none"> Breeding and feeding ground for birds. Support fish and invertebrate larval and juvenile stages. 	4	0	4	4	1	0	0	0
Number of major natural hydrocarbon seeps	<ul style="list-style-type: none"> Unique ecosystem feature and benthic community. 	1,200	0	1,200	900	900	300	0	0
Number of areas of significant upwelling	<ul style="list-style-type: none"> Nutrient supply feeds primary productivity. 	5	2	5	5	5	3	2	2
Number of anoxic basins	<ul style="list-style-type: none"> Unique species assemblage. Nutrient sink. Oil and gas reservoir. 	2	0	2	2	2	2	1	0
Percentage of cetacean migration and feeding corridors (north and south)	<ul style="list-style-type: none"> Vital part of life cycle for a special-status species. 	100%	20%	100%	100%	60%	40%	25%	20%
Percentage of seabird foraging sites	<ul style="list-style-type: none"> Support species diversity and abundance. 	100%	67%	100%	84%	84%	84%	67%	67%

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*Note: data presented in this table was compiled as of 2000.

Table 27. Comparison of Environmental Attributes for Boundary Concepts*

ATTRIBUTES	Significance of Attribute	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of known fish larval sources	<ul style="list-style-type: none"> Important part of life history supporting the diversity of commercial and non-commercial fish species. 	2	0	2	2	2	2	2	0
Number of known submerged American Indian sites	<ul style="list-style-type: none"> Record of past uses. Less subject to human intrusion than terrestrial sites. 	53	18	53	49	49	23	18	18
Number of known submerged historic shipwrecks & aircraft sites	<ul style="list-style-type: none"> Recreational interest. Historic significance and information sources. 	169	154	169	169	169	156	154	154
Number of known submerged historic mainland use sites	<ul style="list-style-type: none"> Historic significance and information sources. 	26	0	26	26	20	6	0	0
Percentage of kelp forests represented	<ul style="list-style-type: none"> Keystone species. Provides food, attachment sites, and shelter for invertebrates and fish. Supports juvenile fish. 	100%	55%	100%	100%	70%	60%	55%	55%
Miles of rocky beach represented	<ul style="list-style-type: none"> Transition from onshore to offshore habitats. Rich assortment of species compared to sandy beach. Seabird foraging. Pinniped haulout. 	159	129	159	159	148	132	129	129
Miles of sandy beach represented	<ul style="list-style-type: none"> Transition from onshore to offshore habitats. Shorebird foraging. Pinniped haulout. High recreational interest in accessible mainland areas. 	168	44	168	168	105	53	44	44
Number of seabird colonies	<ul style="list-style-type: none"> Support species diversity and abundance. Representative mainland and island colonies. 	89	37	89	89	83	37	37	37
Number of pinniped haul out areas	<ul style="list-style-type: none"> Supports most diverse pinniped haulout and rookery areas in the world. 	18	13	18	18	16	13	13	13
Number of mainland watersheds	<ul style="list-style-type: none"> Estuaries support juveniles of offshore species. Link to onshore processes. 	5	0	5	5	3	0	0	0
Total mainland watershed area (square miles)	<ul style="list-style-type: none"> Indicator of pollutant, sediment, and nutrient input into Sanctuary waters. 	4,890	0	4,890	4,890	1,299	0	0	0
Percentage of area linked to rural coastal watersheds	<ul style="list-style-type: none"> Basis for evaluation of mainland human impacts by comparison with pristine island watersheds. 	100%	0%	100%	100%	100%	12%	0%	0%

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*Note: data presented in this table was compiled as of 2000.

Biogeographic Study – Executive Summary⁵²

The priority management goal of the National Marine Sanctuary Program (NMSP) is to protect marine ecosystems and biodiversity. This goal requires an understanding of broad-scale ecological relationships and linkages between marine resources and physical oceanography to support an ecosystem management approach. The Channel Islands National Marine Sanctuary (CINMS) is currently reviewing its management plan and investigating boundary expansion. A management plan study area (henceforth, Study Area) was described that extends from the current boundary north to the mainland, and extends north to Point Sal and south to Point Dume. Six additional boundary concepts were developed that vary in area and include the majority of the Study Area. The NMSP and CINMS partnered with NOAA's National Centers for Coastal Ocean Science Biogeography Team to conduct a biogeographic assessment to characterize marine resources and oceanographic patterns within and adjacent to the Sanctuary. This assessment includes a suite of quantitative spatial and statistical analyses that characterize biological and oceanographic patterns in the marine region from Point Sal to the U.S.-Mexico border. These data were analyzed using an index which evaluates an ecological "cost-benefit" within the proposed boundary concepts and the Study Area.

The Sanctuary resides in a dynamic setting where two oceanographic regimes meet. Cold northern waters mix with warm southern waters around the Channel Islands creating an area of transition that strongly influences the regions oceanography. In turn, these processes drive the biological distributions within the region. This assessment analyzes bathymetry, benthic substrate, bathymetric life-zones, sea surface temperature, primary production, currents, submerged aquatic vegetation, and kelp in the context of broad-scale patterns and relative to the proposed boundary concepts and the Study Area. Boundary cost-benefit results for these parameters were variable due to their dynamic nature; however, when analyzed in composite the Study Area and Boundary Concept 2 were considered the most favorable.

Biological data were collected from numerous resource agencies and university scientists for this assessment. Fish and invertebrate trawl data were used to characterize community structure. Habitat suitability models were developed for 15 species of macroinvertebrates and 11 species of fish that have significant ecological, commercial, or recreational importance in the region and general patterns of ichthyoplankton distribution are described. Six surveys of ship and plane at-sea surveys were used to model marine bird diversity from Point Arena to the U.S.-Mexico border. Additional surveys were utilized to estimate density and colony counts for nine bird species. Critical habitat for western snowy plover and the location of California least tern breeding pairs were also analyzed. At-sea surveys were also used to describe the distribution of 14 species of cetaceans and five species of pinnipeds. Boundary concept cost-benefit indices revealed that Boundary Concept 2 and the Study Area were most favorable for the majority of the species-specific analyses. Boundary Concept 3 was most favorable for bird diversity across the region. Inadequate spatial resolution for fish and invertebrate community data and incompatible sampling effort information for bird and mammal data precluded boundary cost-benefit analysis.

The final chapter integrates data and analyses from each of the preceding chapters utilizing two separate approaches. Cost-benefit indices were ranked for each biological group and for the oceanographic/physical parameters to provide a consistent and comprehensive evaluation of the boundary concepts. The Study Area and Boundary Concept 2 (see Chapter 1) ranked highest for the bird, fish, and mammal groups, as well as all the data in composite. The Study Area also ranked highest for macroinvertebrates. Second, select spatial data were integrated, based on data compatibility and spatial

⁵² Additional information on this assessment, including the full report, is on the project website at http://biogeo.nos.noaa.gov/projects/assess/ca_nms/cinms/.

range, to identify areas of spatial coincidence which may reflect ecosystem “hotspots”. Habitat suitability models for fish and macroinvertebrates, along with bird and mammal sightings information were utilized to evaluate this spatial coincidence. Areas of highest spatial coincidence most closely resemble the spatial delineation for the Study Area and also include a broad area from the mainland south through San Clemente Island.

Integration results highlight the Channel Islands and the area extending north to the mainland to Point Conception as an important ecosystem that supports a diverse array of biological communities. The boundary concepts that were favorably ranked incorporated large areas of the coastal mainland, due in part to the nearshore affinity exhibited by many of the analyzed species. Deep offshore environments away from the Channel Islands were correspondingly less favorable. Both the Study Area and Boundary Concept 2 are characterized by areas of increased upwelling, dynamic surface currents and eddies, and persistent thermal fronts. These concepts also include large areas of important habitats such as kelp, seagrasses, and wetlands along with a mixture of deep and shallow waters that many species depend on for all or part of their life cycles.

In compliance with the National Environmental Policy Act, the National Marine Sanctuary Program will incorporate this assessment with cultural and socio-economic analyses to prepare a Supplemental Environmental Impact Statement to fully analyze boundary change concepts.